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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/827,001	04/19/2004	Gwang Hoon Kwag	423.1043	3479

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EXAMINER	
CHOI, LING SIU	
ART UNIT	**PAPER NUMBER**
1713	

DATE MAILED: 10/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/827,001	KWAG ET AL.	
	Examiner	Art Unit	
	Ling-Siu Choi	1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 July 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *3-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

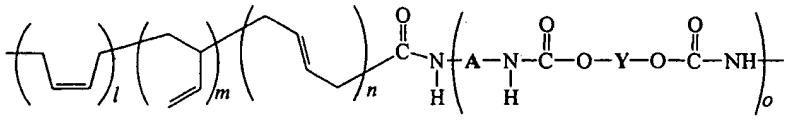
1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/19/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to the Response to Office Action filed July 17, 2006. Claims 1-2 were canceled and claims 33-34 have been added. Claims 3-34 are now pending.

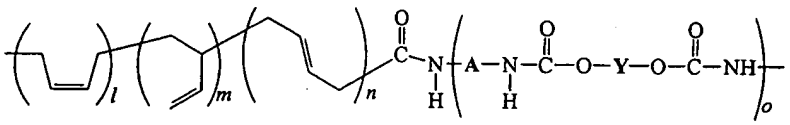
Claim Analysis

2. Summary of Claim 3:

<table>
<tr><td colspan="4">A method to prepare a high 1,4-cis polybutaiene-polyurethane copolymer represented by the following formula 1:
 
wherein l = 94-99%; m = 0-5%; n = 0-5%; o =1-100%; l+m+n = 100%; l/(m+n) =15-100;
and A and Y =C1-20 alkyl or aryl</td></tr>
<tr><td colspan="4">the method comprising</td></tr>
<tr><td>A</td><td colspan="3">polymerizing 1,3-butadiene or butadiene derivatives with a</td></tr>
<tr><td></td><td>catalyst</td><td>a rare earth compound</td><td rowspan="3">in the presence of
a non-polar solvent</td></tr>
<tr><td></td><td></td><td>a halogen-containing compound</td></tr>
<tr><td></td><td></td><td>an organoaluminum compound</td></tr>
<tr><td></td><td colspan="3">to prepare 1,3-butadiene or butadiene derivatives having a high 1,4-cis content ≥ 95%</td></tr>
<tr><td>B</td><td>adding</td><td colspan="2">an isocyanate compound having at least two functional groups</td></tr>
<tr><td></td><td></td><td colspan="2">an alcohol compound having at least two functional groups</td></tr>
<tr><td></td><td colspan="3">with or without base or tin catalyst to the result of the step A</td></tr>
</table>

Summary of Claim 33:

A high 1,4-cis polybutaiene-polyurethane copolymer obtained by the method of Claim 3 and represented by the following formula 1:



wherein **l = 94-99%; m = 0-5%; n = 0-5%**; o =1-100%; l+m+n = 100%; l/(m+n) =15-100; and A and Y =C1-20 alkyl or aryl

Claim Rejections - 35 USC § 103

3. **The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:**

> **(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.**

4. Claims 3-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baack et al. (US 4,242,468 ≅ GB 2 028 356 A) in view of Pedretti et al. (GB 2 002 003 A) and Jenkins et al. (US 5,017,539).

Baack et al. disclose a process to prepare a polyurethane by reacting at least one polyisocyanate with at least one polyol under polyurethane-forming conditions, which may include the presence of a catalyst, in the presence of a monohydroxy-terminated polybutadiene which has a molecular weight of 500 to 100,000, wherein the

use of a polybutadiene diol as polyol is excluded (abstract; claim 1). Baack et al. further disclose that the polisocyanate can be polymethylenepolyphenylene polyisocyanate; the diol can be ethylene glycol; the catalyst can be amine or organo-metallic compound such as dibutyl tin dilaurate (col. 2, lines 19-26; 31-40, and 66).

The difference between the present claims and the disclosure of Baack et al. is requirement of a step to prepare the monohydroxy-terminated polybutadiene having high content of cis-units.

It is noted that Baack et al. are silent on the method to prepare the monohydroxy-terminated polybutadiene having high content of cis-units. Pedretti et al. discose that "[t]here is.... a practical interest in making a butadiene polymer which is totally 1,4-cis since it would crystallise under a pulling stress at temperatures higher than ambient temperatures. This property is commonly a prerequisite in many applications, such as pneumatic tyres" (page 2, lines 8-13). Jenkins et al. also disclose a method to polymerize butadiene to obtain the end capped poly(butadiene) having cis-tacticity higher than 98% in the presence of a catalyst comprising (a) an aluminum hydrocarbyl, (b) neodymium neodecanoate or neodymium naphthenate, and (c) a source of halogen at a temperature of 20°C to 100°C in the hydrocarbon solvent, wherein the source of halogen can be t-butyl chloride (col. 1, lines 4-19 and 54-62; col. 2, lines 32-33 and 40-44; claim 1). In light of the benefit of having high content of cis units for polybutadiene, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adapt the method disclosed by Jenkins et al. in the disclosure of Baack et al. and thereby obtain the present invention.

5. Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baack et al. (US 4,242,468 ≅ GB 2 028 356 A) in view of Pedretti et al. (GB 2 002 003 A).

Baack et al. disclose a polyurethane made by reacting at least one polyisocyanate with at least one polyol under polyurethane-forming conditions, which may include the presence of a catalyst, in the presence of a monohydroxy-terminated polybutadiene which has a molecular weight of 500 to 100,000, wherein the use of a polybutadiene diol as polyol is excluded (abstract; claim 1).

The difference between the present claims and the disclosure of Baack et al. is the requirement of the monohydroxy-terminated polybutadiene to be used in forming the polyurethane having high content of cis units.

It is noted that Baack et al. are silent on the specific tacticity of the monohydroxy-terminated polybutadiene to be used in forming the polyurethane. However, Pedretti et al. disclose that "[i]n the case of poly(1,4-cis-butadiene), crystallisation takes place at room temperature only when the content of 1,4-cis units is very high (L.Gargani et al., Angew. Makrom. Chem., 50, 101 (1976)). There is, thus, a practical interest in making a butadiene polymer which is totally 1,4-cis since it would crystallise under a pulling stress at temperatures higher than ambient temperatures. This property is commonly a prerequisite in many applications, such as pneumatic tyres" (page 2, lines 8-13). In view of such benefit, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use monohydroxy-terminated polybutadiene having high content of cis-units and thereby obtain the present invention.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Kaufhold et al. (US 6,552,153 B1) and Hayashi et al. (US 6,786,839 B2).

Kaufhold et al. disclose a thermoplastic polyurethane prepared by reacting (A) an organic **diisocyanate**; (B) at least one linear **hydroxyl-terminating polyol** selected from the group consisting of polyester diols, polyether diols, and polycarbonate diol; (C) a chain extender selected from diamine, diols, diester of terephthalic acid with glycol, hydroxyalkylene ether of hydroquinone, or ethoxylated bisphenol, and (D) a mixture of hydroxy-terminating **hydrogenated polybutadiene**: $HO\text{-}CH_2\text{-}CH_2\text{-}[(CH_2\text{-}CH_2)_m\text{-}\{CH_2\text{-}CH(CH_2\text{-}CH_3)\}_n]\text{-}CH_2\text{-}CH_2\text{-}OH$ and $\mathbf{CH_3\text{-}CH_2\text{-}[(CH_2\text{-}CH_2)_p\text{-}\{CH_2\text{-}CH(CH_2\text{-}CH_3)\}_q]\text{-}CH_2\text{-}CH_2\text{-}OH}$ in the presence of an amine or an organic metal (tin) compound as a catalyst (col. 5, lines 7-19; claim 1). However, Kaufhold et al. do not teach or fairly suggest the claimed 1,4-cis polybutadiene-polyurethane copolymer.

Hayashi et al. disclose a rubber containing **polybutadiene** prepared in the presence of rare-earth catalyst, wherein the polybutadiene has active an end group and can be modified by reacting with a terminal modifier (abstract; col. 5, lines 7-12). However, Hayashi et al. do not teach or fairly suggest the claimed 1,4-cis polybutadiene-polyurethane copolymer.

7. Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Ling-Siu Choi whose telephone number is 571-272-1098.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reach on 571-272-1114.

LING-SUI CHOI
PRIMARY EXAMINER

Ling-Siu Choi, Ph.D.

September 20, 2006